

Descrizione dell'esemplare

L'animale si presenta molto rovinato in alcune sue parti, soprattutto vicino al capo, a causa dei colpi subiti al momento dell'uccisione. Le parti superiori presentano una colorazione bianco-giallastra; su molte delle squame dorsali sono presenti delle parti brune che nel complesso formano le bande trasversali e leggermente oblique spesso riscontrabili in questa specie. Nella porzione caudale le macchie tendono a formare delle strie longitudinali che diventano continue nella sua parte più distale. Il capo presenta la medesima colorazione del dorso, con tre bande trasversali di colore bruno-olivaceo una all'altezza dell'occhio, una posteriore allo stesso e una al limite fra il cranio e il collo; le parti ventrali sono uniformemente bianco-giallastre. L'iride, giallognola nell'animale morto da poco, ha assunto in breve un colore grigio-azzurro.

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S.E.M. use in the study of *Bonetocardiella conoidea* (Bonet) and *Pithonella ovalis* (Kaufmann) (***)

Utilizzando una metodologia introdotta da uno di noi (Andri E., 1980), vengono qui analizzate al S.E.M. (Microscopio Elettronico a Scansione) le due specie *Bonetocardiella conoidea* (Bonet) e *Pithonella ovalis* (Kaufmann) facenti parte di una ricca associazione a Calcisphaerulidi e Foraminiferi planctonici cenomaniani ritrovata nell'alta Val di Vara (Appennino Ligure).

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Introduction

The finding of a Calcisphaerulidae microfauna in the marlmicrites belonging to the Tavarone Complex (upper Val di Vara, Ligurian Apennines), allows us, thanks to the S.E.M., to make some detailed observations on those microfossils, so important for the Cenomanian stratigraphy.

The specimens are found associated with planktonic Foraminifera, doubtless assigned to the Cenomanian.

In particular we are in presence of the same microfossils found and studied by one of the Authors in the mountains of Leghorn (Andri E., 1972), between Torre del Boccale and Punta del Casotto, south of Antignano (Antignano plane table) and close to Le Vallicette, south of Monte la Poggia (Salviano plane table). The association studied by the Authors comes from the outcrop situated along the Torrente Borsa Valley, 50 mts. east of the small stream that borders the Casa del Re rise (Varese Ligure plane table) (Fig. 1).

The calcimetric analysis made on the powders deriving from these lithotypes, give a carbonate percentage variable from 53.5% to 61.2%; thus it is possible to define them as more or less fossiliferous marlmicrites.

From the thin section analysis it results that quartz grains of detritic origin, whose dimensions can reach up to about 100 μ , and intraclasts are present; incipient recrystallisation phenomena are also visible, put in evidence by microsparite «clouds» with irregular contours within the marlmicritic mass.

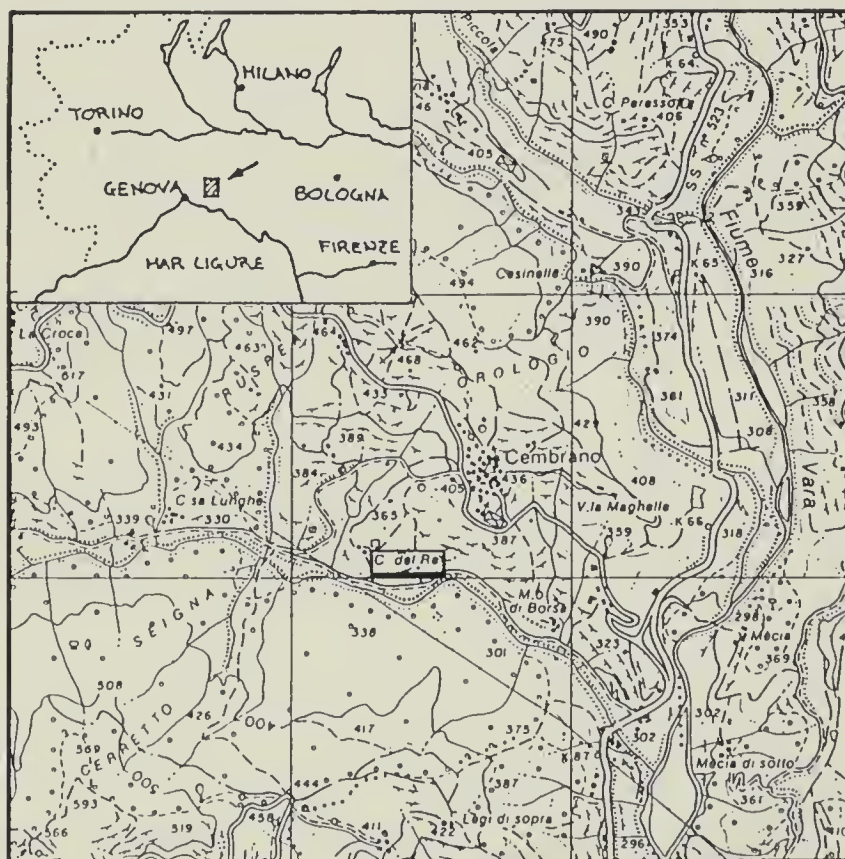


Fig. 1 — Location of Torrente Borsa and of Casa del Re (Upper Val di Vara, Ligurian Apennines).

Scanning electron microscope observations

The scanning electron microscope observations have been made on uncovered portions of thin sections, using a new methodology.

A preliminary research using an optical microscope has been made on section definitely oriented of the organisms object of study.

To avoid the problems due to the uncovered section, we placed on it a slide humidificated with glycerine and distilled water.

At this point, for the S.E.M. examination, the thin section portion to be studied has been drilled, using a drill equipped with a diamond-edge bit (Fig. 2).

The final result is a disk made of slide, glue or adhesive material, and a portion of the thin section.

For the S.E.M. observation, to restore a satisfactory vision of the specimen before its metallization, the disk has been treated for about 1 or 2 seconds with an acid at very low concentration (i.e. 1% diluted HCL), whose reaction has been immediately stopped with a distilled water washing.

The results thus obtained (Fig. 3), have allowed us to observe the wall structure of the microorganisms examined, the surrounding rock matrix, and the degree of recrystallisation of the whole.

It has been also possible to put in evidence, thanks to the slight acid attack, the intimate mingling among the various components that constitute the specimens (clay minerals, calcareous and siliceous silt), as well as a better spatial vision of the rock's texture itself and of the recrystallisation phenomena that involve the organisms' shells.

Observations on *Bonetocardiella conoidea* (Bonet) and *Pithonella ovalis* (Kaufmann)

As already stated in the introduction, the discovery of a rich Cretaceous Calcisphaerulidae microfauna in the Val di Vara, allows a detailed study of the *Bonetocardiella conoidea* (Bonet) and *Pithonella ovalis* (Kaufmann) species.

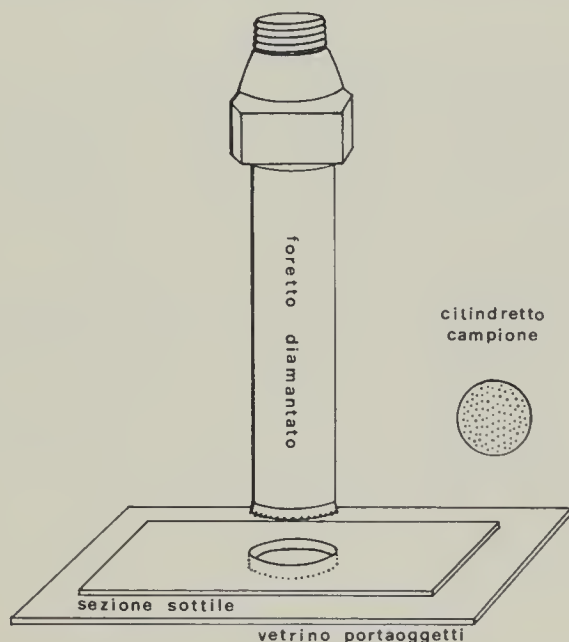


Fig. 2 — Methodology used for the comparative use of optical and S.E.M. microscope.

They are found in association with specimens of «*Calcisphaerula*» *innominata* Bonet ⁽¹⁾, *Andriella trejoi* (Bonet) ⁽²⁾ «*Stomiosphaera*» *sphaerica* (Kaufmann), as well as planktonic Foraminifera such as: *Planomalina buxtorfi* (Gandolfi), *Rotalipora appenninica* (Renz), *Rotalipora cushmani* (Morrow), *Hedbergella trocoidea* (Gandolfi), *Ticinella roberti* (Gandolfi), *Globigerinelloides* sp., *Shackoina cenomana* (Shacko), *Praeglobotruncana stephani* (Gandolfi), *Praeglobotruncana delrioensis* (Plummer) and *Heterohelix* sp.

Such association, in which numerous are the *Planomalina buxtorfi* (Gandolfi), *Rotalipora appenninica* (Renz) and *Rotalipora cushmani* (Morrow), together with two specimens of *Schackoina cenomana* (Shacko), gives to the formation a Cenomanian, maybe upper Cenomanian, age, confirmed by the presence of a *Rotalipora* sp. that already presents an hint of the double keel. This is a characteristic that foreshadows the coming of the *linnei-lapparenti* group of *Globotruncana*, appearing for the first time during the Turonian.

It is interesting to point out that our specimens *Bonetocardiella conoidea* (Bonet), *Phitonella ovalis* (Kaufmann), «*Calcisphaerula*» *innominata* Bonet, *Andriella trejoi* (Bonet) and «*Stomiosphaera*» *sphaerica* (Kaufmann), are also found associated with planktonic Foraminifera of the *Rotalipora*, *Praeglobotruncana*, *Planomalina*, *Schackoina*, *Ticinella*, *Hedbergella*, *Globigerinelloides* and *Heterohelix* genus. This would confirm the hypothesis that they are very good facies fossils, probably connected with a particular sedimentary environment, like the one represented by the external zone of the continental shelf (Andri E., 1980, p. 30).

***Bonetocardiella conoidea* (Bonet)**

The S.E.M. observations made with the technique described above, confirms the characteristics of this species, as well as its real variability that goes from subconical to bell-shaped or roughly hearth-shaped forms, with a more or less accentuated invagination of the wall around the opening.

Together with such typical specimens it is confirmed the presence of *Bonetocardiella conoidea* var. *extraflexa* Andri, that presents the typical characteristics described by the Author himself.

As far as the wall is concerned, because of the high degree of recrystallisation, it is possible to detect only the presence of two of the three layers described by Andri (Andri E., 1972); the dimensional variability and the length/width ratio are also confirmed.

***Phitonella ovalis* (Kaufmann)**

The *Phitonella ovalis* (Kaufmann) specimens taken into account in this paper present too the typical characteristics of this species, both in shape and dimensions.

The high degree of diagenetic recrystallisation of the shells should confirm the presence of at least two of the three layers forming the wall

⁽¹⁾ We consider this species in the open nomenclature as far as the genus is concerned, keeping for now the «*Calcisphaerula*» name, because even if it is not possible to find a secure trace of an opening, we think that it is still possible to assign it to the genus *Phitonella* Lorenz 1902 emend. Bignot and Lezard 1964 (Andri E., 1972).

⁽²⁾ From Bolli H. M., 1974, p. 845.

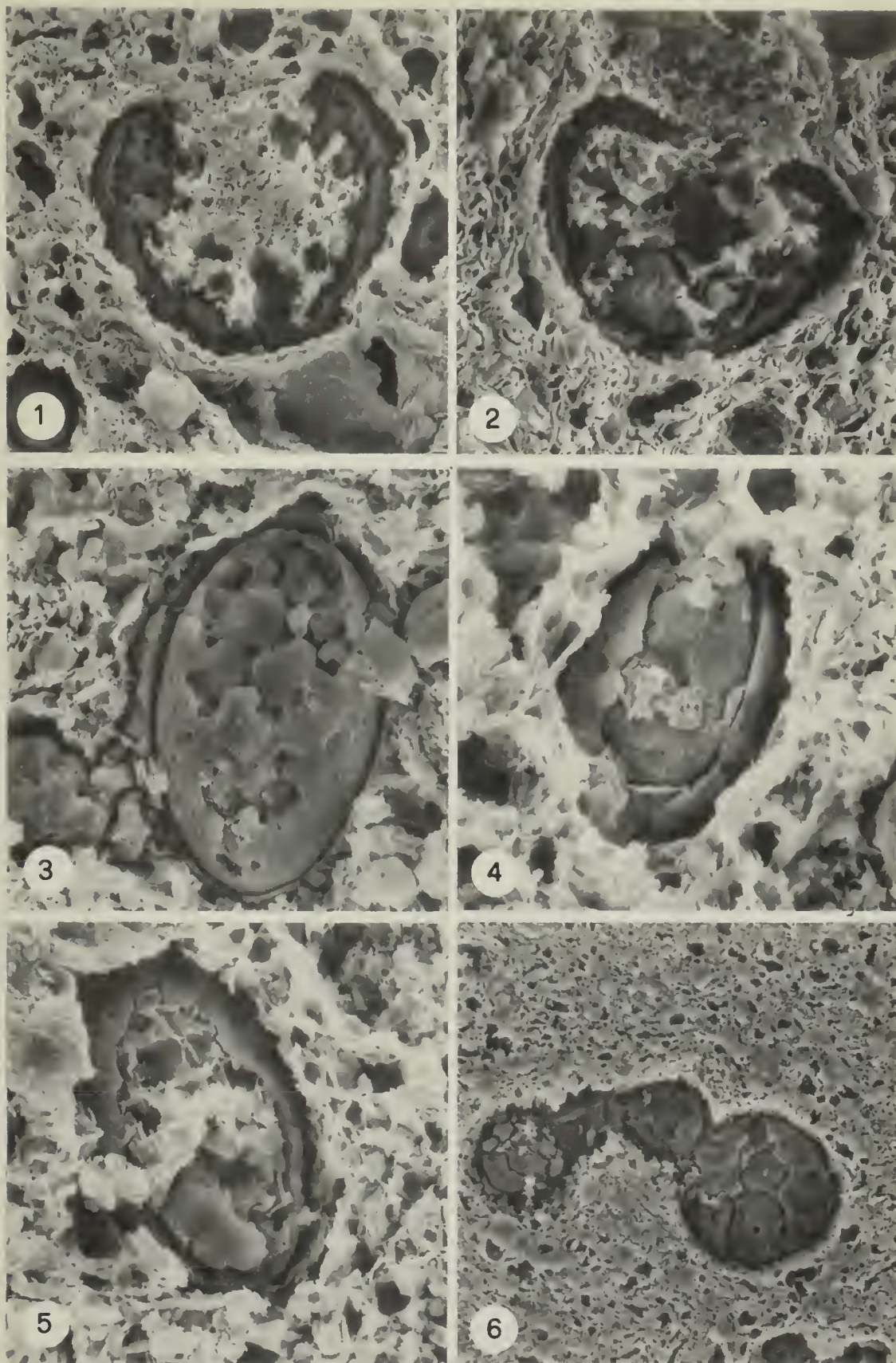


Fig. 3 — Specimens from Casa del Re marlmicrites. After being chosen from uncovered thin sections, they have been taken and observed with the S.E.M. 1 and 2) *Bonetocardiella conoidea* (Bonet), longitudinal sections (real variability); $\times 400$. 3) *Pithonella ovalis* (Kaufmann) section, with slightly sloped tangent plane respect to the axial plane; $\times 530$. 4 and 5) *Pithonella ovalis* (Kaufmann), parallel sections to the axial plane; $\times 800$, $\times 620$. 6) *Ticinella roberti* (Gandolfi); $\times 190$.

(Fig. 3, specimens 3, 4, and 5), as described in Andri E. and Aubry M. P., p. 162, pl. 3.

Conclusions

The study of uncovered portions of thin sections with the scanning electron microscope, has confirmed its usefulness because it allowed us to perfectly compare them to the observations made with the optical microscope, and to study the microfossils with definitely oriented sections.

The artificials introduced with such technique are totally negligible. Rather, this methodology, if used for the marlmicrites texture and, more in general, for mix-composition sedimentary rocks, can greatly help to put in evidence the single rock components and their spatial disposition in a differentiated way.

Though the high degree of recrystallisation of the shells, it has been possible to confirm the presence in *Pithonella ovalis* (Kaufmann) and *Bonetocardiella conoidea* (Bonet) of at least two layers in the wall composition and, on specimen 3 on figure 3, of the calcite crystals arrangement that form the intermediate layer.

On specimens 3, 4 and 5 on figure 3, it has been possible to observe the degree of recrystallisation of the shell filling; such filling is made of more or less coarse anhedral crystals of spar calcite. Such crystals are also well visible in the chamber filling of the *Ticinella roberti* (Gandolfi) specimen shows on the figure.

Such anhedral crystals can weld together even further, to create a single crystal in which superimposed lamella weldings are still visible to testify the process (Fig. 3, specimen n° 4).

In the background paste texture are well visible the clay minerals that are put in even better evidence by the slight acid attack. Irregular fragments of calcite and quartz that constitute the roughest portion of the thin fraction are also well visible.

In general it is possible to confirm the importance of Calcisphaerulidae for detailing the Cretaceous stratigraphy; their presence and geographical distribution allows, among other things, to locate with a certain precision which were the Mesozoic Tethys margins that stretched with equatorial trend from Mexico to the Carpaths.

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